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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/590,029

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EXAMINER

HAGAN, SEAN P

ART UNIT

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PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/590,029	Applicant(s) SATO ET AL.	
	Examiner SEAN HAGAN	Art Unit 2828	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 19 March 2009.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 12-20 and 22-26 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 12-20 and 22-26 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

1. Claims 1 through 11 originally presented for examination. Claims 1 through 11 canceled by preliminary amendment 18 August 2006. Claims 12 through 21 added by preliminary amendment 18 August 2006. Claim 21 cancelled by amendment received 26 November 2007. Claims 12 and 14 amended by amendment received 12 June 2008. Claims 22 through 26 added by amendment received 12 June 2008. Claims 12, 14, and 22 amended by amendment received 19 March 2009. Claims 12 through 20 and 22 through 26 are pending in this application.

Response to Arguments

2. Applicant's arguments have been fully considered but they are not persuasive.
3. Applicants add limitation to a feedback circuit, however the details of these limitations appear to be mostly supported by the required features of a prior art device. As such, paragraph [0013] of applicant's disclosure indicates these limitations to be known in the art at the time of invention.
4. Applicants reprise arguments against Ledentsov et al. (Ledentsov, US Patent 2003/0206741). Applicants state that detuning can generally ignore absorption of light at 40meV or greater as illustrated by applicant's Figure 4 citing a moderately level portion of the figure at that range. Applicant's invention is characterized to operate by utilizing a reverse biased voltage to reduce the effective detuning so as to increase the

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absorption. It is noted that primary reference Tamura et al. ("Ultrafast electroabsorption modulators with traveling-wave electrodes", Lasers and Electro-Optics Society, 2001. LEOS 2001. The 14th Annual Meeting of the IEEE, Vol. 1, 12-13 Nov. 2001 pp. 97-98, hereafter Tamura) operates under the same principles in this respect. Positioning of the initial detuning determines the absorption of the modulation structure where modulation is undesirable and determines the amount of voltage required to increase the absorption in the structure from the original value and, as such, positioning of the initial detuning value in a region of low absorption is expected as shown in applicant's Figure 4 where the admitted prior art range which may, largely, be linearly interpolated from the claimed range.

5. Further art has been discovered which is more closely related to Tamura than Ledentsov. The address of the claims has been modified to reflect application of more closely related art.

6. As such, all claims are addressed as follows:

Claim Rejections - 35 USC § 103

7. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

8. Claims 12, 13, 14, 16, 17, 18, 19, 20, 22, 23, 24, 25, and 26 rejected under 35 U.S.C. 103(a) as being unpatentable over Tamura et al. ("Ultrafast electroabsorption modulators with traveling-wave electrodes", Lasers and Electro-Optics Society, 2001. LEOS 2001. The 14th Annual Meeting of the IEEE, Vol. 1, 12-13 Nov. 2001 pp. 97-98,

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hereafter Tamura) in view of Koren et al. (Koren, US Patent 5,889,898) and further in view of applicant's admitted prior art (AAPA).

9. **Regarding claim 12**, Tamura discloses, "In which a semiconductor laser and an electroabsorption optical modulator are integrated on a high resistance semiconductor substrate" (pg. 97, col. 2, last paragraph starting "A schematic diagram..."). "Wherein said electroabsorption optical modulator is of a configuration that satisfies a condition $L \times B > 2000 \mu\text{m} \times \text{Gb/s}$ where L is a length of said electroabsorption optical modulator and B is an operating frequency" (pg. 98, col. 1, second full paragraph starting "Figure 5 shows..."). "An absorption peak wavelength of said electroabsorption optical modulator is shorter than an oscillation wavelength of said semiconductor laser" (pg. 97, col. 1, last paragraph starting "This device has..."). Tamura does not disclose, "The energy conversion value ΔX of a detuning amount, which is the difference between said oscillation wavelength and said absorption peak wavelength at room temperature, satisfies a condition $40 \text{ meV} < \Delta X < 100 \text{ meV}$." Koren discloses, "The energy conversion value ΔX of a detuning amount, which is the difference between said oscillation wavelength and said absorption peak wavelength at room temperature, satisfies a condition $40 \text{ meV} < \Delta X < 100 \text{ meV}$ " (col. 9, lines 9-33). It would have been obvious to one of ordinary skill in the art at the time of invention to combine the teachings of Tamura with the teachings of Koren. Detuning amounts presented as reasonable by Koren would have been suitable for use with the invention of Tamura. The selection of something based on its known suitability for its intended use has been

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held to support a prima facie case of obviousness. *Sinclair & Carroll Co. v. Interchemical Corp.*, 325 U.S. 327, 65 USPQ 297 (1945).

10. The combination of Tamura and Koren does not disclose, "A feedback circuit which monitors an element temperature and which increases an offset voltage according to decreases in temperature." AAPA discloses, "A feedback circuit which monitors an element temperature and which increases an offset voltage according to decreases in temperature" (p. [0013]). It would have been obvious to one of ordinary skill in the art at the time of invention to combine the teachings of the combination of Tamura and Koren with the teachings of AAPA. Temperature compensation as taught in applicant's admitted prior art would enhance the combination of Tamura and Koren by allowing a degree of temperature independence.

11. **Regarding claim 13**, the combination of Tamura, Koren, and AAPA does not disclose, "Wherein said prescribed bias voltage applied at a minimum operating temperature is 1 V or less." It would have been obvious to one of ordinary skill in the art at the time of invention to select the most preferable driving voltage, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. *In re Aller*, 105 USPQ 233.

12. **Regarding claim 14**, Tamura discloses, "Wherein said electroabsorption optical modulator has a pair of electrodes arranged on one surface of said high-resistance

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semiconductor material" (pg. 97, col. 2, last paragraph starting "A schematic diagram..."). "A prescribed bias voltage is applied to said electrodes" (pg. 97, col. 2, last paragraph starting "A schematic diagram..."). "Said pair of electrodes are a P-type electrode and an N-type electrode" (pg. 97, col. 2, last paragraph starting "A schematic diagram...").

13. The combination of Tamura, Koren, and AAPA does not disclose, "Said P-type electrode is a traveling-wave electrode." It would have been obvious to one of ordinary skill in the art at the time of invention to set desired traveling electrode as p-type, since it has been held to be within the general skill of a worker in the art to select a known material on the basis of its suitability for the intended use as a matter of obvious design choice. *In re Leshin*, 125 USPQ 416.

14. **Regarding claim 16**, Tamura discloses, "Wherein active layers of said semiconductor laser and said electroabsorption optical modulator are composed of layers buried by a semiconductor or a dielectric" (Fig. 2).

15. **Regarding claim 17**, the combination of Tamura, Koren, and AAPA does not disclose, "Wherein said buried layers are undoped layers." It would have been obvious to one of ordinary skill in the art at the time of invention to provide undoped barrier layers, since it was known in the art that barrier layers may be provided undoped.

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16. **Regarding claim 18**, Tamura discloses, "Wherein quantum wells of an active layer of said semiconductor laser and quantum wells of an active layer of said electroabsorption optical modulator are joined by a butt joint" (pg. 97, col. 2, last paragraph starting "A schematic diagram...").

17. **Regarding claim 19**, Tamura discloses, "Wherein the quantum wells of said electroabsorption optical modulator are of a structure wherein an energy level of a conductive band of wells is higher than an energy level of a conductive band of the barriers" (pg. 97, col. 2, last paragraph starting "A schematic diagram..."). "An energy level of a valence band of the wells is higher than an energy level of a valence band of the barriers" (pg. 97, col. 2, last paragraph starting "A schematic diagram...").

18. **Regarding claim 20**, Tamura discloses, "Wherein aluminum is contained in a composition of the active layer of said electroabsorption optical modulator" (pg. 97, col. 2, last paragraph starting "A schematic diagram...").

19. **Regarding claim 22**, Tamura discloses, "In which a semiconductor laser and an electro absorption modulator are integrated on a high resistance substrate" (pg. 97, col. 2, last paragraph starting "A schematic diagram..."). "Wherein said electroabsorption optical modulator is of a configuration which satisfies the condition $L \times B > 2000\mu\text{m} \cdot \text{Gb/s}$ where L is a length of said electroabsorption optical modulator and B is an operating frequency" (pg. 98, col. 1, second full paragraph starting "Figure 5 shows...").

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Tamura does not disclose, "An absorption peak wavelength of said electroabsorption optical modulator is shorter than an oscillation wavelength of said semiconductor laser."

"The energy conversion value ΔX of a detuning amount, which is the difference between said oscillation wavelength and said absorption peak wavelength at room temperature, satisfies a condition $40\text{meV} < \Delta X < 100\text{meV}$." Koren discloses, "An absorption peak wavelength of said electroabsorption optical modulator is shorter than an oscillation wavelength of said semiconductor laser" (col. 9, lines 9-33). "The energy conversion value ΔX of a detuning amount, which is the difference between said oscillation wavelength and said absorption peak wavelength at room temperature, satisfies a condition $40\text{meV} < \Delta X < 100\text{meV}$ " (col. 9, lines 9-33). It would have been obvious to one of ordinary skill in the art at the time of invention to combine the teachings of Tamura with the teachings of Koren for the reasons provided above regarding claim 12.

20. The combination of Tamura and Koren does not disclose, "A feedback circuit which monitors an element temperature and which increases an offset voltage according to decreases in temperature." AAPA discloses, "A feedback circuit which monitors an element temperature and which increases an offset voltage according to decreases in temperature" (p. [0013]). It would have been obvious to one of ordinary skill in the art at the time of invention to combine the teachings of the combination of Tamura and Koren with the teachings of AAPA for the reasons provided above regarding claim 12.

21. The combination of Tamura, Koren, and AAPA does not disclose, "Said prescribed voltage applied at a minimum operating temperature is 1V or less." It would

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have been obvious to one of ordinary skill in the art at the time of invention to select the most preferable driving voltage, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. *In re Aller*, 105 USPQ 233.

22. **Regarding claim 23**, the combination of Tamura, Koren, and AAPA does not disclose, "Wherein the modulator does not require a temperature control mechanism for keeping a temperature of the modulator uniform." It would have been obvious to one of ordinary skill in the art at the time of invention to omit a temperature control mechanism, since it has been held that omission of an element and its function in a combination where the remaining elements perform the same functions as before involves only routine skill in the art. *In re Karlson*, 136 USPQ 184.

23. **Regarding claim 24**, the combination of Tamura, Koren, and AAPA does not disclose, "Wherein an amplifier is unnecessary." It would have been obvious to one of ordinary skill in the art at the time of invention to not amplify the output light, since it was known in the art that one may elect to not amplify the output of a laser device should the output achieved be deemed sufficient for the purpose to which the device is applied.

24. **Regarding claim 25**, the combination of Tamura, Koren, and AAPA does not disclose, "Wherein an amplifier is unnecessary." It would have been obvious to one of ordinary skill in the art at the time of invention to not amplify the output light, since it was

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known in the art that one may elect to not amplify the output of a laser device should the output achieved be deemed sufficient for the purpose to which the device is applied.

25. **Regarding claim 26**, Tamura discloses, "Wherein $2000\mu\text{m} \cdot \text{Gb/s} < L \times B < 80000\mu\text{m} \cdot \text{Gb/s}$ " (pg. 98, col. 1, second full paragraph starting "Figure 5 shows...").

26. Claim 15 rejected under 35 U.S.C. 103(a) as being unpatentable over Tamura in view of Koren in view of AAPA and further in view of Kamioka et al. (Kamioka, JP Patent 2001-024289).

27. **Regarding claim 15**, the combination of Tamura, Koren, and AAPA does not disclose, "Wherein an active layer of said electroabsorption optical modulator has an undoped layer." "A thickness of said undoped layer gradually decreases with progression in a direction of progression of oscillation light from said semiconductor laser." Kamioka discloses, "Wherein an active layer of said electroabsorption optical modulator has an undoped layer" (abstract). "A thickness of said undoped layer gradually decreases with progression in a direction of progression of oscillation light from said semiconductor laser" (abstract). It would have been obvious to one of ordinary skill in the art at the time of invention to combine the teachings of the combination of Tamura, Koren, and AAPA with the teachings of Kamioka. Introduction of specific modulator design of Kamioka would enhance the teachings of Tamura and Koren by prolonging the lifetime of the modulator part.

Conclusion

28. Any inquiry concerning this communication or earlier communications from the examiner should be directed to SEAN HAGAN whose telephone number is (571)270-1242. The examiner can normally be reached on Monday-Friday 7:30 - 5:00.

29. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Minsun O. Harvey can be reached on 571-272-1835. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

30. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/S. H./
Examiner, Art Unit 2828

/Minsun Harvey/
Supervisory Patent Examiner, Art Unit 2828

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